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(Bulletins 269 to 275 constitute the Report for 1918. In binding, pages i-xii at the end of this bulletin should be detached and placed before Bulletin 269 which begins with page 1)

Maine Agricultural Experiment Station

ORONO

BULLETIN 275 **DECEMBER, 1918**

ABSTRACTS OF PAPERS NOT INCLUDED BULLETINS, FINANCES, METOR-OLOGY, INDEX.

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AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE

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ROYDON L. HAMMOND,		*Seed Analyst and Photographer*

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* Absent on leave during period of war.

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APR 9 1919

BULLETIN 275

ABSTRACTS OF PAPERS PUBLISHED BY THE STATION IN 1918 BUT NOT INCLUDED IN THE BULLETINS.

A complete list of all the publications issued by and from the Station in 1918 is given on pages x to xi of the introduction to this Report. The following pages contain abstracts of the papers issued during the year that are not included in the Bulletins or Official Inspections for the year.

STUDIES IN INHERITANCE OF CERTAIN CHARACTERS OF CROSSES BETWEEN DAIRY AND BEEF BREEDS OF CATTLE.*

This constitutes a preliminary paper on the crossbred herd now being brought together by the Maine Agricultural Experiment Station for the purpose of studying some of the outstanding problems of dairy husbandry.

The first section of the paper is devoted to a study of the inbreeding in the foundation herd. It is shown that the inbreeding as measured by the best mathematical methods is no greater than would be expected to occur in any of the modern breeds when the animals were selected at random. Consequently it is safe to assume that the results of the study are not due to the width of the crosses, for, as has been pointed out, a number of the animals famous in their breed have been far more inbred than any of the parental stock used in these experiments.

The individual records of the animals composing both the parental generation and the first and second filial generations are given.

Black body color is dominant to the other colors in the first generation. In the second generation an orange-coated bull and a dark Jersey dun-coated heifer were segregated out. This is to be explained on the basis of a recessive dilutor in the Guernsey, segregated out along with the black color. The dark heifer shows that the Jersey does not normally possess this factor.

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*This is an abstract from a paper by John W. Gowen, having the same title and published in the Jour. Agr. Research, Vol. XV No. 1, pp. 1-57.

It has been shown that white marking of the body taken as a whole appears as a dominant. Study of the individual white areas, however, indicate that this is due to white in the inguinal region only, for this alone appears as such a dominant. The white spots on the face (star, star snip, and blaze), neck, shoulders, rump, flanks, and legs are, in general, suppressed in their offspring when such animals are mated to solid color.

As has been suggested, but as has never been tested before, the pigmented muzzle is dominant to the one not so pigmented.

Agreeing with the previous work of this laboratory it is shown that a pigmented tongue is dominant to a non-pigmented one.

A black switch appears to cause the suppression of the other switch colors in the offspring. Because of this suppression and because all of the matings had at least one animal with a black switch as parent, it was impossible to study the behavior of the other colors. There was one case of segregation of a deep red-orange switch from a back cross of a black animal carrying an orange coat and white switch, genetically. This case showed the segregation of the factor for orange switch from that for both white and black.

The character of polledness has been studied. Two-horned animals resulting from crosses of polled x horned appeared. On the basis of the other results these could not have resulted from a heterozygous polled condition. One of these cases had the horns tight on the head and the other loose. These cases then form exceptions to the previously accepted hypothesis of simple dominance for the polled character and require a subsidiary hypothesis. The hypothesis suggested is that the testes have some action on the presence or absence of horns. Partial proof of this hypothesis is given by the fact that of the polled animals 10 were females, 2 males, 1 doubtfully polled. Of those with scurs 1 female and 7 males had loose scurs; of those with tight scurs all (3) were males; of those with horns all (2) were males. This would seem like a clear case where the male has some influence. The explanation of this difference appears to be due to a hormone secreted by the germ cells. Should this prove true, this forms an interesting parallel between cattle and sheep, in which the sex glands are known to produce such changes.

The qualities of beef production are shown to be divisible into four general regions of the body: head, fore quarters, barrel, and hind quarters. The type of head and heavy, deep fleshed fore quarters are transmitted to the offspring when either parent is of the Aberdeen-Angus breed. The body and hind quarters appear intermediate, but resemble most the dairy parents.

Data are given on the milk and fat production of some of the crossbreds. The results indicate that milk and fat production behave separately. High milk production is dominant to low, but high fat percentage is recessive to a low fat percentage in the milk.

STUDIES IN MILK SECRETION

IV. On the Variation and Mode of Secretion of Milk Solids.*

This paper is the fourth of a series of studies on milk now being conducted in the Biological Laboratory of the Maine Agricultural Experiment Station. The data for this study are taken from the semi-official year records of the pure bred Holstein-Friesian cows compiled and supervised by the Holstein-Friesian Association.

The means, standard deviations and coefficients of variation are given for these year records. The mean annual productions are 15417 pounds of milk, 528 pounds of butter-fat, 1303 pounds of solids-not-fat. The standard deviations are respectively 3742 pounds of milk, 134 pounds of butter-fat, 260 pounds of solids-not-fat and 2 years. The coefficients of variation are respectively 24, 25, 20 and 50. These data show Holstein-Friesian milk for one year to be large in amount and high in the ratios of solids-not-fat to butter-fat as compared with other breeds.

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*This is an abstract from a paper by John W. Gowen, having the same title published in the Jour. Agr. Research.

The correlations and linearity of regression between the variables butter-fat per cent, amount of milk and age at commencement of test lead to the following conclusions.

As the amount of milk given by the cows in this test increases, the percentage composition of the butter-fat decreases. The amount of this decrease is highly significant measured statistically. Considered practically this fall in butter-fat content could not be easily detected in small samples. No such effect is noted for the solids-not-fat or put in another way, the quantity of milk produced for one year is independent of the concentration of the solids-not-fat. This, from the view of inheritance, means that the hereditary units for high or low milk production are separate and distinct from those causing a high or low percentage of solids-not-fat.

The correlations of the age when the yearly record commences with butter-fat and with solids-not-fat brings out the following points. Age of the cow does not effect the percentage of butter-fat in the milk significantly. As the age of a cow advances each lactation brings with it a decrease in the percentage of the solids-not-fat found in the milk.

This differential action of amount of milk produced and age gives us the criterion to prove that butter-fat and solids-not-fat cannot have a common mother substance from which they are derived by splitting.

The correlations between the variables, pounds of milk, butter-fat and solids-not-fat lead to the following conclusion. (a). Some of the factors responsible for high concentration of butter-fat are also responsible for high concentration of some of the solids-not-fat in cow's milk. (b). Practically considered this means that if it is desired to improve either the butter-fat or solids-not-fat concentration of the milk of a given herd, the determination of the concentration of either solid and selection of the animals accordingly will result in a corresponding increase for the other solid.

Taken in conjunction with the above results the diurnal variations of cow's milk furnish the facts necessary to test the hypothesis to account for the mode of secretion of the milk solids. The data show that evening milk is between 0.678 and

0.723 per cent higher in butter-fat than the morning milk throughout the whole lactation. No appreciable difference occurs in the solids-not-fat.

For the clear understanding of the bearing of these data on the hypothesis to account for the mechanical mechanism by which the solids are released into the milk, it seems best to restate them in as simple terms as possible. These hypothesis may be placed in three groups:

A. The mammary gland cells break loose bodily and disintegrate in the alveoli.

B. The portion of the cells toward the alveoli become loaded with solids, break loose from the basal portion and disintegrate to form the milk solids.

C. The cells of the mammary gland secrete the materials of milk solids without themselves breaking down.

These data offer criteria between the theories to account for the secretion of the milk solids. On the cell disintegration theories the cell must contain a fixed quantity of solids-not-fat while the butter-fat varies so that in the longer interval between milkings the cell accumulates less fat than in the shorter time, or taken the other way, the cell contains relatively more protein and sugar than fat as the interval between milkings lengthens. This is contrary to our knowledge of fat formation for it is commonly accepted that first comes the cells composed largely of protoplasm and that as time goes on this cell is more and more loaded with fat at the expense of the protoplasm. Unless these mammary cells behave very differently in the formation of this fat than other body cells this variation is enough to seriously discredit the hypothesis of cell disintegration to account for these milk solids and in fact, to make it an absurdity. Furthermore, as far as our knowledge of the variations of secretory glands goes the variation of this milk, fall in well with the secretory hypothesis to account for these solids.

THE MEADOW PLANT BUG. *MIRIS DOLABRATUS*.*

(1) *Miris dolabratus* has been a conspicuous insect in timothy meadows in portions of the eastern United States dur-

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*This is an abstract of a paper by Herbert Osborn, Consulting Entomologist, having the same title and published in the Journal of Agricultural Research, Vol. XV, No. 3, pp. 175-200. Oct. 21, 1918.

ing the past 40 years and now has a distribution as far west as Illinois and Minnesota and south in the Mississippi Valley into Kentucky.

(2) It is believed to be an introduced species, coming from Europe with timothy hay or other large stemmed grass shipped for forage or packing some time between 1800 and 1825.

(3) It feeds upon cultivated grasses, especially timothy, orchard grass, and meadow fescue, and when abundant must seriously affect the value of the crop.

(4) It is a dimorphic species, there being two forms of females, a long-winged and a short-winged form, the latter being far more plentiful, about 90 per cent.

(5) The species hibernates in the egg form; hatching occurs about May 25 to June 10 in Maine; and the nymphs pass through five instars of about six or seven days each, adults occurring from early July, mating and laying eggs from July 10 to August 1 for the short-winged forms necessarily in the fields where the females have developed.

(6) The eggs are laid in stems of grass or clover in fields where females have grown, being thrust through the wall of the stem and held by an expanded cap which is firmly held by the walls of the stem, the egg being protected in the hollow of the stem and in this position remain for at least eight or nine months before hatching.

(7) Measures for control so far evident and based on habits determined will consist especially of rotation, with probably some advantage from burning, early cutting, pasturing heavily in fall, and possibly by mechanical devices for capturing the nymphs or adults.

(8) The spread of the insect should be prevented by care in the disposition of timothy hay moved to a distance. No hay from an infested district should be allowed to be scattered in or near meadows in localities where the insect is not already present.

(9) Natural enemies consist so far as at present known of spiders, the predacious damsel bugs, *Reduviolus ferus,* a tachnid fly, *Phorantha occidentis,* and an undetermined species and a species of fungus, *Entomophthora* sp.

METEOROLOGICAL OBSERVATIONS.

For many years the meteorological apparatus was located in the Experiment Station building and the observations were made by members of the Station Staff. June 1, 1911, the meteorological apparatus was removed to Wingate Hall and the observations are in charge of Mr. James S. Stevens, professor of physics in the University of Maine.

In September, 1914 the meteorological apparatus was again moved to Aubert Hall, the present headquarters of the physics department.

The instruments used were at Lat. 44° 54′ 2″ N. Lon. 64° 40′ 5″ W. Elevation 135 feet.

The instruments used are the same as those used in preceding years, and include: Maximum and minimum thermometers; rain guage; self-recording anemometer; vane; and barometers. The observations at Orono now form an almost unbroken record of fifty years.

METEOROLOGICAL SUMMARY FOR 1918

Observations Made at the University of Maine

1918	January	February	March	April	May	June	July	August	September	October	November	December	Average	Total
Highest temperature	39	48	62	71	88	89	92	89	78	69	60	50	--------	--------
Lowest temperature	—22	—19	—11	21	31	35	51	38	31	25	14	—4	--------	--------
Mean temperature	11.1	17.4	27.9	43.2	57.6	59.5	68.5	65.7	55.5	48.1	37.4	24.0	42.99	--------
Mean temperature in 50 years	16.46	14.59	30.15	40.02	51.62	60.77	65.95	66.09	59.71	50.74	38.08	24.19	42.75	--------
Total precipitation in inches	3.55	2.91	1.65	2.20	1.69	2.41	6.89	2.58	4.29	5.47	2.33	2.00	--------	37.97
Mean precipitation in 50 years	2.54	3.47	4	2.93	3.53	3.47	3.49	2.33	3.42	3.86	3.44	3.51	--------	--------
Number of days with precipitation of .01 or more	12	11	5	6	6	8	12	7	11	11	9	4	--------	102
Snowfall in inches	35.5	19	16.5	1.5	--------	--------	--------	--------	--------	--------	--------	23.25	--------	95.75
Mean snowfall in 50 years	21.8	21.45	15.15	5.82	.23	--------	--------	--------	--------	.74	7.02	16.73	--------	--------
Number of clear days	18	14	19	22	22	17	15	21	15	18	17	12	--------	210
Number of fair days	4	5	4	3	5	8	14	6	8	9	5	11	--------	82
Number of cloudy days	9	9	8	5	4	5	2	4	7	4	8	8	--------	73
Total movement of wind in miles	3672	3939	4632	4780	4878	3790	2973	2890	3050	3852	3757	2800	3751	45013

REPORT OF THE TREASURER

The Station is a department of the University and its accounts are kept in the office of the Treasurer of the University. The books, voucher files, etc., are, however, all distinct from those of the other departments of the University. The classification of accounts is that prescribed by the auditors on the part of the Federal Government, and approved by the State Auditor. All of the accounts are audited by the State Auditor, and the Hatch Fund and Adams Fund accounts are also audited by the Office of Experiment Stations acting for the United States Secretary of Agriculture in accordance with Federal Law.

The income of the Station from public sources for the year that ended June 30, 1918, was:

U. S. Government, Hatch Fund appropriation.....	$15,000 00
U. S. Government, Adams Fund appropriation....	15,000 00
State of Maine, Animal Husbandry investigation appropriation	5,000 00
State of Maine, Aroostook Farm investigation....	5,000 00

The cost of maintaining the laboratories for the inspection analyses is borne by analysis fees and by the State Department of Agriculture. The income from sales at the experiment farms is used for the expense of investigations. The printing is paid for by an appropriation to the University.

At Aroostook Farm there are in connection with the cooperative work with the Federal Department of Agriculture expenditures mostly under "labor" for the Department and for which the Station is reimbursed. There are also certain expenditures for the Department made from sales of crops from Department investigations that do not appear in the tabular statements. They are carried as distinct and separate accounts, always with credit balances, on the Station ledger.

REPORT OF TREASURER FOR FISCAL YEAR ENDING JUNE 30, 1918

DISBURSEMENTS

Receipts	Hatch fund	Adams fund	Animal husbandry investigations
Salaries	5813.54	9256.98	3777.30
Labor	2696.58	1290.52	96.15
Publications	175.83	--------	--------
Postage and Stationery	982.19	49.61	65.79
Freight and Express	162.81	99.17	19.01
Heat, light and power	585.82	243.52	--------
Chemical and laboratory supplies		17.50	6.04
Seeds, plants and sundry supplies	448.73	355.00	137.11
Fertilizers	639.65	--------	--------
Feeding stuffs	1477.33	3122.81	477.87
Library	208.18	--------	--------
Tools, machinery and appliances	353.43	33.00	--------
Furniture and fixtures	135.83	--------	--------
Scientific apparatus and specimens	6.20	--------	98.67
Live stock	37.50	--------	8.25
Traveling expenses	488.08	344.29	66.17
Contingent expenses	40.00	40.00	160.00
Buildings	748.30	147.60	147.61
Total	15000.00	15000.00	5059.97

REPORT OF TREASURER FOR FISCAL YEAR ENDING JUNE 30, 1918 —Concluded.

DISBURSEMENTS

Receipts	Aroostook farm	General account	Inspection analysis
Salaries	1800.00	3137.62	9674.10
Labor	5641.93	1813.85	--------
Publications	--------	89.29	--------
Postage and Stationery	32.11	74.47	622.33
Freight and Express	51.71	124.49	121.16
Heat, light and power	76.44	340.76	507.51
Chemical and laboratory supplies	6.48	101.95	578.72
Seeds, plants and sundry supplies	1130.90	1499.11	14.84
Fertilizers	826.15	--------	--------
Feeding stuffs	1909.01	603.99	--------
Library	--------	5.25	--------
Tools, implements and machinery	105.50	585.50	--------
Furniture and fixtures	33.10	43.11	40.78
Scientific apparatus	--------	1.52	113.08
Live stock	400.00	200.00	--------
Traveling expenses	32.37	97.95	139.23
Contingent expenses	99.50	461.43	73.17
Buildings	507.37	370.44	--------
Total	11842.57	9550.73	11884.92

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